**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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| Examiner: | Sikyin Ip |
| Applicant: | Joseph W. Harris |
| Title: | PHOSPHORUS-COPPER BASE BRAZING ALLOY |
| Attorney Docket: | JWH-59US |
| Confirmation No.: | 4424 |

THIRD AFFIDAVIT OF ROBERT HENSON UNDER 37 C.F.R. § 1.132, ¶1

My name is Robert Henson. I am the Technical Director of the J.W. Harris Co., and have held that position for the last ten years. I have been employed by J.W. Harris Co. for a total of twenty-seven years. In my current and past capacities with J.W. Harris Co., I have had extensive experience with brazing alloy compositions, various forms of brazing components, the use of brazing fluxes, and the brazing of copper parts. I work with customers on brazing applications and conduct braze training courses. I chair the American Welding Society A5H subcommittee on Brazing Filler Metals and Fluxes. I am also an American Welding Society Certified Welding Inspector.

I have reviewed the PL 149319 reference ("the Polish Abstract"). Under my direction, alloy A, as set forth in the table below, was made into a powder ("Powder A") at my direction.

| Alloy | P | Sn | Si | Ni | Ag | Sb | Cu |
|---|---|---|---|---|---|---|---|
| A | 0.1 | 25 | 0.5 | 0.1 | 15 | 0.1 | Balance |

The Powder A had about a 50 mesh size, which corresponds to a majority of particles being below 297 μm. Powder A corresponds exactly to the example set forth in the second-to-last line of the Polish Abstract, but falls outside the claimed ranges in the present application.

I attempted to braze copper T-Joints using the Cu alloy powder, as taught by the Polish Abstract, without the carrier that forms the paste together with the alloy powder, and without any commercial brazing flux. Stated differently, I attempted to braze the Cu alloy powder in the Example of the Polish Abstract in a fluxless solid powder form without any additions to the powder. I was unable to get the powder to melt and flow. Attached to my

Affidavit are several pictures illustrating the inability to melt and flow the Cu alloy powder taught by the Polish Abstract.

1. The first picture is entitled "Powder A: No Carrier; No Flux, Before Braze Test." It shows the powder placed at the joint interface of a copper-to-copper T-Joint assembly.

2. The second picture is "Powder A: No Carrier; No Flux, Beginning Heat." Heating was accomplished with an oxygen-acetylene torch. I attempted to first heat the copper to preheat the metal and avoid melting the braze material (Powder A) prematurely. I then directed the torch flame toward the joint. This is an accepted brazing procedure. As the picture shows, Powder A had begun to glow, indicating heat, but there was no evidence of Powder A melting.

3. The third picture is "Powder A: No Carrier; No Flux, Copper > 1292°F." The picture illustrates that the copper is very hot, but there is still no melting of Powder A. At this point, the copper is above 1292°F (973K).

4. The fourth picture is "Powder A: No Carrier; No Flux, After Braze Test." This picture shows the finished assembly. Powder A finally melted, but did not flow into the capillary to effect a braze. The copper assembly had to be heated to a point close to its melting temperature, which is about 1980°F, and despite this, a braze could not be made. Thus, the final picture of this series shows that even after Powder A melted, it did not flow into the capillary, and the two pieces of the T-Joint assembly easily separated.

5. The Polish Abstract stated that the brazing could be performed below 973 K, which corresponds to 1292°F, when the Cu alloy powder (Powder A) is in the paste form with the Carrier. The Examiner stated that "PL 149319 teaches to add paste to lower the brazing temperature. In view of said teaching in PL 149319 that it is contemplated within ambit of ordinary skill artisan to eliminate paste when lower brazing temperature is not needed. It is well settled that omission of an element (here paste and carrier) and its function where not needed is obvious." However, I was not able to obtain a braze either below 973K, or at temperatures well above 973K, when using either the paste of Powder A + Carrier or when using Powder A alone. Thus, as a skilled artisan, I could not form a braze following the teachings of the Polish Abstract either with respect to the Cu alloy powder in paste form or in the solid powder form alone.

6. Thus, I attempted to follow the teachings of the Polish Abstract, both in its broad teachings and its specific example, and I was unable to form a braze using a brazing paste as taught therein. I also attempted to follow the teachings of the Polish Abstract with respect to the Cu alloy powder, but eliminating the use of the Carrier, which the Examiner suggested would be contemplated by the ordinary skilled artisan, and still was unable to form a braze using the Cu alloy powder as taught therein.

7. Based upon my experiments, the Cu alloy powder taught by the Polish Abstract is not "self-fluxing" on copper, i.e., is does not provide enough de-oxidation to readily wet the copper surface, and to thus allow the alloy to melt and flow into the capillary to form the braze.

The Polish Abstract does not suggest that a flux must be used in addition to or in place of the Carrier, and as one skilled in the art, I would read the reference to imply that the

carrier is used instead of a flux. Nonetheless, I attempted to form a braze by adding a standard commercial brazing flux in an amount of 3 grams of flux per 1 grams of powder in place of the Carrier. Attached to this Affidavit are several pictures illustrating the effect of commercial flux on the Cu alloy powder taught by the Polish Abstract.

8. The fifth picture is entitled "Paste A: w/ Flux; No Carrier, Before Braze Test." It shows the paste of the 1 part Cu alloy Powder A and 3 parts commercial flux placed at the joint interface of a copper-to-copper T-Joint assembly.

9. The sixth picture is "Paste A: w/ Flux; No Carrier, Beginning Heat; Flux Flow." Heating was accomplished by the same heating procedure as explained above. The picture shows the flux beginning to separate and flow into the joint, but there was no evidence of Powder A melting.

10. The seventh picture is "Paste A: w/ Flux; No Carrier, Further Heat; Powder Melting." The picture shows the powder beginning to melt.

11. The eighth picture is "Paste A: w/ Flux; No Carrier, After Braze Test." This picture shows the finished assembly with melted braze filler metal in the capillary. The flow of Powder A into the capillary was very sluggish. The low phosphorus content does not provide enough de-oxidation to readily wet the surface. Only the addition of a commercial chemical flux provides that function.

12. The Cu alloy taught by the Polish Abstract is not "self-fluxing" on copper. Phosphorus-copper brazing alloys should be self-fluxing to meet air-conditioning/refrigeration needs, and to allow use on copper medical gas piping. In medical gas piping, the relevant specifications do not allow flux use on copper connections.

Thus, previously, as set forth in a prior affidavit ("First Affidavit of Robert Henson Under 37 C.F.R. § 1.132, ¶1"), I carried out experiments in an attempt to duplicate the teachings of the Polish Abstract, which were to combine a Cu alloy powder with a methyl cellulose/glucose/water Carrier to form a paste, and to braze the paste to copper components at a temperature below 1292°F. Following these teachings, I was unable to form any brazed joints because I could not get the paste to properly melt and flow at temperatures below or above 1292°F. In the present experiments, I also attempted to duplicate the teaches of the Polish Abstract as to the alloy powder alone, but eliminating the Carrier to determine if the Cu alloy powder can be used as a solid brazing component. Again, I was unable to form any brazed joints because I could not get the powder to melt and flow at temperatures below or above 1292°F. Thus, I followed the teachings of the reference and found that neither the paste nor the Cu alloy powder taught in the Polish Abstract permits brazing as alleged therein. Further, as one skilled in the art, the Polish Abstract suggests to me that a flux need not be used due to the presence of the carrier. However, the only possible way to form a brazed joint from the Cu alloy powder was

to substitute a known commercial flux for the Carrier, despite the contrary suggestion of the reference. So, I further found that the Cu alloy powder taught in the Polish Abstract can not be used as a fluxless solid brazing component.

Further declarant sayeth naught.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

IN WITNESS WHEREOF, I hereto set my hand and seal at Warren County, Ohio, this 24th day of February, 2006.

Robert Henson

STATE OF OHIO:

:ss.

COUNTY OF WARREN;

Before me 24th day of February, 2006, personally appeared Robert Henson, known to me to be the person whose name is subscribed to the foregoing and acknowledged that he executed the same as his free act and deed for the purposes therein contained.

Notary Public

My Commission Expires: 3-10-2009

NOTARY PUBLIC
AMY LEINDECKER
Notary Public, State of Ohio
My Commission Expires
March 10, 2009

[Notary's Seal Here]